WE CLAIM AS OUR INVENTION:

1. A method for intraoperatively generating and updating a volume dataset, comprising the steps of:

(a) acquiring a series of n 2D X-ray projections of biological tissue of a patient respectively at n different projection angles with an X-ray system, each of said projections having an associated projection geometry selected from the group consisting of known projection geometries and determinable projection geometries;

(b) reconstructing a first volume dataset from said n 2D X-ray projections using said associated projection geometries;

(c) intraoperatively acquiring m 2D X-ray projections of the patient from m different projection angles with said X-ray system, wherein $m<n$;

(d) determining respective projection geometries for said intraoperatively acquired m 2D X-ray projections;

(e) replacing m 2D X-ray projections in said series n 2D X-ray projections with said intraoperatively acquired m 2D X-ray projections, thereby leaving n-m 2D X-ray projections that were not replaced in said series of n 2D X-ray projections; and

(f) reconstructing an updated volume dataset using said intraoperatively acquired m 2D X-ray projections and at least some of said n-m 2D X-ray projections.

2. A method as claimed in claim 1 wherein step (a) comprising acquiring said series of n 2D X-ray projections of said biological tissue in an initial position, and wherein said biological tissue is subsequently changed in position to a changed position, and wherein step (f) comprises reconstructing said updated volume dataset

so as to contain image information of said biological tissue in said initial position and after the biological tissue has changed to said changed position.

3. A method as claimed in claim 2 comprising differently coding said image information representing said biological tissue in said initial position and the image information representing said biological tissue in said changed position, allowing the respective image information to be visually distinguishable.

4. A method as claimed in claim 3 comprising selecting said coding from the group consisting of gray scale coding and color-coding.

5. A method as claimed in claim 2 comprising the additional steps of subtracting said first volume dataset from said updated volume dataset to obtain a third volume dataset comprising only image information of said biological tissue in said changed position, and coding said third volume dataset to produce a coded third volume dataset, and fusing said coded third volume dataset with said first volume dataset to form a modified updated volume dataset.

6. A method as claimed in claim 2 wherein steps (a) and (c) comprise acquiring said series of n 2D x-ray projections and said series of m 2D x-ray projections of bone fragments, as said biological tissue.

7. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for acquiring said series of m 2D x-ray projections at respective positions that are substantially the same as respective positions of said x-ray system for acquiring said series of n 2D x-ray projections in step (a).

8. A method as claimed in claim 7 comprising automatically bringing said x-ray system to said same positions by a motor drive of said x-ray system.

9. A method as claimed in claim 7 comprising manually bringing said x-ray system to said same positions with electronic monitoring from at least one of angle transmitters and position transmitters.

10. A method as claimed in claim 7 comprising bringing said x-ray system to said same positions using a mechanical arresting mechanism that interacts with said x-ray system.

11. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by calculation, in a calibration procedure, from said projection geometries in step (a).

12. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by interpolation, from said projection geometries in step (a).

13. A method as claimed in claim 1 comprising employing a C-arm x-ray apparatus, having an x-ray source and a radiation receiver mounted on a C-arm, as said x-ray system in steps (a) and (c).

14. A method for intraoperative generation of an update volume dataset, comprising the steps of:

(a) acquiring a series of n 2D X-ray projections of a patient from n different projection angles with an X-ray system, each of said projections having

an associated projection geometry selected from the group consisting of known projection geometries and determinable projection geometries;

(b) reconstructing a first volume dataset from said n 2D X-ray projections using said associated projection geometries;

(c) intraoperatively acquiring m 2D X-ray projections of the patient from m different projection angles with said X-ray system, wherein m<n;

(d) determining respective projection geometries for said intraoperatively acquired m 2D X-ray projections;

(e) reconstructing a second volume dataset using said intraoperatively acquired m 2D X-ray projections and the projection geometries that were determined in step (d) and

(f) fusing said first volume dataset with said second volume dataset to form an updated volume dataset.

15. A method as claimed in claim 14 wherein step (a) comprising acquiring said series of n 2D X-ray projections of said biological tissue in an initial position, and wherein said biological tissue is subsequently changed in position to a changed position, and wherein step (f) comprises reconstructing said updated volume dataset so as to contain image information of said biological tissue in said initial position and after the biological tissue has changed to said changed position.

16. A method as claimed in claim 15 comprising differently coding said image information representing said biological tissue in said initial position and the image information representing said biological tissue in said changed position, allowing the respective image information to be visually distinguishable.

17. A method as claimed in claim 15 comprising selecting said coding from the group consisting of gray scale coding and color-coding.

18. A method as claimed in claim 15 comprising coding the information of the biological tissue in said changed position in said second volume dataset prior to fusing said first volume dataset with said second volume dataset.

19. A method as claimed in claim 15 wherein steps (a) and (c) comprise acquiring said series of n 2D x-ray projections and said series of m 2D x-ray projections of bone fragments, as said biological tissue.

20. A method as claimed in claim 14 comprising positioning said x-ray system in step (c) for acquiring said series of m 2D x-ray projections at respective positions that are substantially the same as respective positions of said x-ray system for acquiring said series of n 2D x-ray projections in step (a).

21. A method as claimed in claim 20 comprising automatically bringing said x-ray system to said same positions by a motor drive of said x-ray system.

22. A method as claimed in claim 20 comprising manually bringing said x-ray system to said same positions with electronic monitoring from at least one of angle transmitters and position transmitters.

23. A method as claimed in claim 20 comprising bringing said x-ray system to said same positions using a mechanical arresting mechanism that interacts with said x-ray system.

24. A method as claimed in claim 14 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said

projection geometries respectively associated with said m 2D x-ray projections by calculation, in a calibration procedure, from said projection geometries in step (a).

25. A method as claimed in claim 14 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by interpolation, from said projection geometries in step (a).

26. A method as claimed in claim 14 comprising employing a C-arm x-ray apparatus, having an x-ray source and a radiation receiver mounted on a C-arm, as said x-ray system in steps (a) and (c).